

## NEST-SITE COMPETITION WITH BLUE TITS AND GREAT TITS AS A POSSIBLE CAUSE OF DECLINES IN WILLOW TIT NUMBERS: OBSERVATIONS IN THE CLYDE AREA

James Maxwell

7 Lilac Hill, Hamilton, ML3 7HG

### INTRODUCTION

Willow tits *Parus montanus* are resident and sedentary, defending their territory throughout the year, and showing a habitat preference for areas of wet woodland (Perrins, 1979). Although the numbers and range of this species across continental Europe are thought to be stable (Hagemeijer & Blair, 1997), the 'new atlas of breeding birds' showed the willow tit to have contracted in breeding range in Britain between 1970 and 1990 (Gibbons *et al.*, 1993), with a particularly large reduction in Scotland. By 1990, willow tits nested only in small pockets of the borders, Galloway, Ayrshire and the Clyde, with a single record north of the central lowlands. This contraction in Scotland follows disappearance from Inverness, Ross, Angus, Perth, Fife and the Lothians in earlier decades, which has been tentatively ascribed to factors such as severe winters during the 1940s-50s and loss of habitat (Thom, 1986). Since 1990, declines in numbers and breeding range of the willow tit have continued, and perhaps accelerated, throughout its range in Britain. Willow tit numbers on Common Bird Census plots of the British Trust for Ornithology fell by 56% during 1988-1998, and showed a 29% fall from 1998 to 1999 (Sanderson *et al.*, 2000). Lanarkshire is now the northern limit for the species in Britain, and the neighbouring small isolated populations in Ayrshire and Galloway are in serious decline to very few pairs (Murray, 2000). Winter conditions and habitat loss seem inadequate as explanations for this drastic population contraction. Willow tits are maintaining healthy populations in much colder climates, such as northern Norway, Finland and Russia (Hagemeijer & Blair, 1997), while many areas of apparently suitable breeding habitat in Scotland remain, but now lack willow tits. This study was therefore undertaken to try to find reasons for the decline of the willow tit, and in particular to test whether providing artificial nest sites within suitable breeding areas could help to maintain the remaining pairs in the now tiny and isolated population in Lanarkshire.

### METHODS

Willow tit territories in Lanarkshire were located by listening for the characteristic song and contact calls of this species. Locating territories was enhanced by amplified playback of tape recordings of willow tit vocalisations, which was extremely effective in eliciting responses from willow tits within a distance of as much as 1 km. Once found, pairs of willow tits were visited throughout the year to record their presence and behaviour, especially in the early breeding season. Since there are no marsh tits *Parus palustris* in the Lanarkshire area, species recognition was simple even when based

only on visual observation. Unlike blue tits *P. caeruleus* and great tits *P. major*, willow tits only nest in cavities that they excavate for themselves, normally in the rotten stump of a tree. Particular attention was given to the nest construction activities of willow tits in order to glean indications of a suitable design for a willow tit nestbox, and to monitor their breeding activity to see whether the population decline may be related to some cause of breeding failure.

The "nest box" is basically a bark-covered plastic tube with an internal nest chamber, filled to the entrance hole with fine wood shavings (design details are given in Appendix 1); it was first placed in willow tit territories and used by the birds in 1995. At present, there are 136 boxes distributed through 22 areas of Lanarkshire (Figure 1) where willow tits have been found holding territory or where they have previously bred. Of these, 7 areas currently hold breeding birds; the species has always easily located these purpose-designed boxes and excavated them readily.

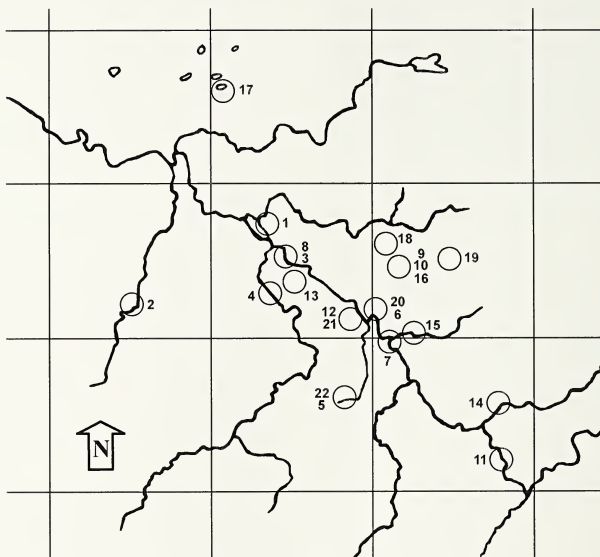
In addition to monitoring breeding success of willow tits in natural sites and in nestboxes, since 1996 the nestlings have been marked with nest-specific colour rings in order to provide information on their post-fledging survival and natal dispersal. A number of adults have also been caught on their territory during winter by mist net and marked with individual colour ring combinations, allowing their survival and pairings to be recorded.

### RESULTS

#### *Habitat, nest sites, nest construction, incubation and fledging.*

Willow tit territories were located in a range of habitats, from mature woodland with minimal ground cover through regenerating woodland with moderate understorey of brambles etc., to thick birch carr with heather ground cover. Nest sites were found on flat or sloping ground, even on the sides of steep valleys. The preferred decaying timber is birch, with alder another favourite. The average hole-height above ground level in natural sites is 1.5 m, but cavities can be as high as 10.5 m from the ground. During March, willow tits were seen to make trial borings in several stumps, but by April the effort is usually concentrated on one site, with both birds actively engaged in excavation work. The entrance hole dug out is slightly oval (the long axis vertical) and about 3 cm across. Debris falls underneath the site at first, but as the excavation proceeds to form a chamber in a downward direction, the birds turn and fly out with shavings and carry them progressively further away, eventually to up to 20 m. At this stage, birds make up to 4 visits per minute, one bird waiting while the other excavates. This work is carried out in an open, busy fashion and can continue for

Figure 1. Locations of willow tit territories investigated on the R. Clyde system during the study from 1994-2001: 1=Strathclyde CPark, Motherwell; 2=Calder Glen, East Kilbride; 3=Baron's Haugh, Motherwell; 4=Chatelherault CPark, Hamilton; 5=Candermoss, Stonehouse; 6=Garrion Gill foot, Overtown; 7=Mauldslic, Rosebank; 8=Ross Tip, Hamilton; 9=Harestonehill, Newmains; 10=Eastmuir Plan., Newmains; 11=Upper Clyde, New Lanark; 12=Millburn Glen, Larkhall; 13=Merryton, Larkhall; 14=Claghorn Glen, Lanark; 15=Jock's Gill, Carluke; 16=Greenhead Wood, Waterloo; 17=Drumpellier CPark, Coatbridge; 18=Coltness Woods, Coltness; 19=Auchter Water, Newmains; 20=Garrion Gill head, Overtown; 21=Upper Millburn, Ashgill; 22=Canderwood, Stonehouse.



several days. When the cavity is complete, the female then builds a minimal nest - a felt-like pad of fine hairs, grasses and fibres. She incubates, and is fed on the nest by the male, but occasionally leaves the eggs unattended, concealing them with ruffled nest material. Both parents share chick-feeding duties and when the young fledge, they are dependent for about a fortnight, then gradually disperse.

#### *Use of nest boxes, and breeding data*

The "nestbox" (Appendix 1) has proved very successful, and is regularly adopted by willow tits. In 1996, 5 young fledged from a nest box at Strathclyde Country Park and a pair held territory at Baron's Haugh. In 1997, two pairs bred in the Wishaw and Lanark areas, both in nestboxes, and

produced 14 young. Five pairs were located in 1998, producing 28 young. In 1999, two pairs were successful in natural stumps, producing 14 young. In 2000 there were six pairs producing 47 young (two pairs in nestboxes, four in natural sites), and in 2001, three pairs in natural stumps had 17 young. A fourth pair at Coltness used a box to the nesting stage but then deserted (see further note). Sightings of unringed birds hinted at the existence of other breeding pairs in the area but there are probably no more than 8-20 pairs of willow tits now remaining in Lanarkshire.

#### *Site fidelity and dispersal*

A colour ringed male willow tit has bred at the same site at Eastmuir Plantation, Newmains, each year for four successive seasons, but each season

with a different female. Young birds given site-specific colour rings were found establishing a territory, on average, only about 1-2 km from their natal site. In Lanarkshire, the main stronghold of willow tit breeding is in the area centering on Newmains, Wishaw and Coltness, with other sites near Larkhall. One fledgling travelled 6 km from Coltness to a site at Baron's Haugh. From one brood of 9 chicks at Larkhall (in 2000), one moved to Baron's Haugh (5 km), one to Wishaw (4 km), one to Garrion Gill (3 km) and one moved 2 km, all in different directions. The Garrion Gill female has bred (in 2001) with a previously dispersed male bird from Larkhall (1998) – i.e. this pair shared the same parent and did the same journey, but two years apart. In spite of this kind of consistency in dispersal, many young, including 3 whole broods out of 16, have never been traced, so either dispersed to unknown locations or did not survive. The two Willow Tits that dispersed all the way to Baron's Haugh were males and apparently did not find females in 2001 and have left that area.

#### *Interactions with blue 0 tits*

At nut feeders during winter, willow tits are subordinate to great tits and blue tits. Similarly, at nest sites, willow tits can be displaced by great tits or blue tits. Observations of willow tits in the Lanarkshire study area showed that these birds frequently lose their newly excavated nest site to a pair of blue or great tits. During five years of study till 2000, of only some 30 willow tit pair-years, I observed 18 nest take-overs by blue tits and two by great tits. Of these, 16 were take-overs of newly excavated nestboxes, and four were take-overs of newly excavated natural sites. This probably underestimates the frequency of take-over of natural sites since it was easier to make observations at nestboxes. One example of this interaction was recorded at the territory of a pair of willow tits at Strathclyde Country Park in 1995. This pair excavated five successive nestboxes, losing each in turn to pairs of blue tits. In mid-May, they at last got to the egg stage in a nest-box, only to fail, due to heavy snow. Eventually in late May, their last box was excavated, but, due possibly to energy depletion, only to a depth just under the nest-hole. In the later stages, this inevitably left the young openly vulnerable to predators and the brood was lost (Nilsson 1984). Meanwhile the Blue Tits had raised families successfully in all their acquired sites. In the 2001 breeding season alone, there were 7 Blue Tit and 6 Great Tit take-overs from the nestboxes. In the afore-mentioned Coltness failure at the nest stage, both Blue Tit and Great Tit pairs were seen showing great interest in the nest, although they did not use the box. It may well be that even at the nest stage, aggression by the dominant tits can be sufficient to make a pair desert, as was witnessed at Jock's Gill in 1999, when the Willow Tits were witnessed being chased around the nest area before deserting.

## DISCUSSION

In colder countries such as Russia and Finland, young birds usually join adults in adjoining areas and capitalize, in the winter, on food that the older birds have stored (Cramp & Perrins, 1993). In Lanarkshire, storing food seems not to be so vital, and youngsters are often found holding territories on their own in the post-natal year. Willow tits in Lanarkshire seem rarely to join winter mixed flocks of tits, but remain in their territory throughout the year. The dispersal of juveniles from their natal territory to establishing a territory of only a few hundred meters to a few kilometres away is typical of willow tits in Britain; Cramp & Perrins (1993) state that 78% of willow tit ring recoveries came from within 5 km of the ringing location. Only one recorded movement in Britain exceeded 50 km. This would suggest that the Lanarkshire population of willow tits is effectively a closed, isolated population, since the nearest (Ayrshire) population is almost extinct, and the (declining) Galloway and Borders populations are about 100 km away, so are unlikely to provide immigrants to the Lanarkshire area.

The specially designed nestboxes were readily accepted by willow tits and good numbers of young have been reared in these boxes. Wired to a tree at knee to shoulder height they look like bark-covered stumps with a tempting bit of decay, which attracts investigative pecking. They satisfy several criteria; being light to carry, cheap to make, waterproof, fairly long-lasting and unobtrusive, so that they are not noticed when in vandal-prone areas. They have also proved invaluable in monitoring the presence of Willow Tits in new areas, as they are always excavated if the species is there. Although it is unlikely that willow tits are limited by a lack of natural sites for nesting, the nestboxes are particularly easy to excavate, and so the energetic cost of cavity construction will be much reduced. This may be important given the problems willow tits face from blue tits and great tits. My observations strongly suggest that an important factor in the decline of the willow tit has been the tendency for blue tits and great tits, having witnessed all the afore-mentioned excavation activity, to take over newly excavated willow tit nest chambers, forcing the willow tits to start a new excavation elsewhere. A series of such thwarted attempts to breed may impair the body condition of adult willow tits, and it is a general feature of birds that late breeding tends to be less successful and fledglings reared late in the season tend to have low survival prospects (Perrins & Birkhead, 1983), (Bromssen and Jansson, 1980). It is likely that blue tit and great tit populations have increased over recent decades as a result of increased provision of winter food in suburban gardens. It is also possible that these species, facing gradually reducing nesting facilities due to the great development of improved housing etc. since the fifties, have expanded into typical willow tit habitat to breed; if so, their liking for new, ready-made sites may be the main cause of

the demise of willow tits. This hypothesis invites further research. At the suggestion of Chris Mead (BTO), placing willow tit nest boxes in pairs may help to mitigate this interaction; blue tits take over the first excavated nest box, but permit the willow tits to nest in the adjacent box. Preliminary evidence (in 2000) suggested that this was an effective strategy, but although many nest-box placings were converted to this system in 2001, there was still no significant improvement. Further experimenting along these lines will take place.

#### ACKNOWLEDGEMENTS

I am most grateful to the Hamilton branch of the RSPB and Neil Darroch for help in willow tit surveying fieldwork, Matt Mitchell for nest-box work, and Iain Livingstone for ringing the birds. I thank North Lanarkshire Council for their interest and support, the BTO, SNH and B&Q for funding this study, and Bob Furness for generous advice in the preparation of this paper.

#### REFERENCES

- Bromssen, A. Von & Jansson, C. (1980) *Ornis scandinavica* 11: 173-178
- Cramp, S. & Perrins, C.M. (eds.) (1993). *The Birds of the Western Palearctic* Vol. VII. Oxford University Press.
- Gibbons, D.W., Reid, J.B. & Chapman, R.A. (1993). *The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991*. T & AD Poyser.
- Hagemeijer, W.J.M. & Blair, M.J. (1997). *The EBCC Atlas of European Breeding Birds*. T & AD Poyser.
- Murray, R. (2000). 1998. *Scottish Bird Report No. 31*. Scottish Ornithologists Club
- Nilsson, S. G. (1984) *Ornis scandinavica* 15: 167-175.
- Perrins, C. M. (1979). *British Tits*. Collins.
- Perrins, C.M. & Birkhead, T. R. (1983). *Avian Ecology*. Blackie.
- Sanderson, F., Marchant, J. & Glue, D. (2000). Changes in breeding bird populations, 1998-99. *BTO News* 228, 10-13.
- Thom, V.M. (1986). *Birds in Scotland*. T&ADPoyser.

#### APPENDIX 1. Details of the willow tit "nest box" design used in this project.

The Willow tit nest box is constructed from a plastic tube of 11 cm diameter, covered with Cypress bark held in place by chicken mesh. Two tin lids are laid on screws to limit the size of the nest chamber to 22 cm high, with crumpled newspaper used to fill the space above the upper lid. The tube between the two lids is filled with wood shavings. An entrance hole of 3 cm diameter is cut in the tube, 10 cm from the top. The top of the tube is sealed with a plastic cover. The nest box is attached to a tree trunk at about 1-2 m off the ground. Placing nest boxes in pairs, about 3 m apart, seems to be the best way to ensure that willow tits are able to nest in one of the pair of boxes if blue tits or great tits are active in the area.

